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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/539,254

06/16/2005

Shoji Miyake

123612

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25944 7590 06/25/2008

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ALEXANDRIA, VA 22320-4850

EXAMINER

KACKAR, RAM N

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

06/25/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/539,254	<b>Applicant(s)</b> MIYAKE ET AL.	
	<b>Examiner</b> Ram N. Kackar	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 03 March 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 5-56 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 5-56 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>various</u> .   | 6) <input type="checkbox"/> Other: _____                          |



## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 20 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In this claim a capacitor located in proximity to an antenna is disclosed to detect voltage applied to the antenna. This is not explained in the disclosure. Since one of ordinary skill in the art will not understand this, it is necessary that it be explained by the disclosure. It appears that the capacitor is part of the detection circuit.

### *Claim Rejections - 35 USC § 102*

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. **Claims 5-7, 11-14, 16, 18, 24-26 and 32-37 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Yamakoshi et al (US 2001/0021422).**

Yamakoshi et al disclose a plasma generator for a vacuum chamber (Abstract), a stage (Fig 29) to hold a substrate (base plate) and multiple RF antennas attached to sidewalls arranged

parallel to the stage (Fig 29, 30 and paragraph 141). Although the length of conductor is not disclosed it can be fairly estimated from the size of the vacuum housing and the frequency applied (13.54 MHz-  $\lambda/4 = 5.5\text{m}$ ) that it is much less than  $\lambda/4$ . The antennas are connected in parallel. Yamakoshi et al further teach phase detectors and phase shifters (phase matcher) and power meters for regulating the phases of RF power supplied to the antennas (electrode) and impedance matching circuits controlled by controller.

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. **Claims 5-14, 16, 18, 23-26 and 29-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masaji et al (JP 2001-035697) in view of Koji et al (JP 2000-073174).**

Masaji et al disclose a plasma generator for a vacuum chamber (Abstract), a stage (Fig 1-4) to hold a substrate (base plate) and multiple RF antennas attached to sidewalls arranged parallel to the stage (Fig 11). The antennas are connected in parallel. Although the length of conductor is not disclosed it can be fairly estimated from the size of the vacuum housing and the frequency applied (13.54 MHz-  $\lambda/4 = 5.5\text{m}$ ) that it is much less than  $\lambda/4$ . The antennas are connected in parallel and could be coated with an insulator. Also disclosed are impedance elements (11) and (C<sub>b</sub>).

Masaji et al however do not disclose that they are connected through a conductive plate.

Koji et al disclose the plurality of antennas connected in parallel being connected through plate like conductors (Fig 2)

Since plate like conductors can provide secure connections at required distance (important since that may introduce some phase shift) it would be obvious for one of ordinary skill in the art at the time of invention to use plate like conductors for parallel connections.

Regarding the limitation of aspect ratio of the antenna according to the definition of the aspect ratio in the specification it is clear that aspect ratio determines the projection of the antenna towards the center of the substrate, it is obvious that the RF field (inductive as well as capacitive) will be oriented further in according to this projection. The very fact that Masaji et al disclose multiple antennas is the recognition that antennas have stronger RF fields in their vicinity and by controlling there position spatial distribution of plasma density is controlled.

Since no specific relation ship between aspect ratio and plasma property at a specified target is claimed, the broad requirement of the claims is considered obvious.

**12. Claim 15-16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masaji et al (JP 2001-035697) in view of Minoru Kanda (JP 2002-260899).**

Masaji et al disclose a plasma generator for a vacuum chamber where plurality of antennas are connected in parallel to one power supply and do not disclose each antenna connected to a separate power supply.

Minoru Kanda discloses similar arrangement of plurality of antennas but connected to individual power supplies (abstract and Fig 5).

Since this arrangement allows individual control of power and phase shifts it is more flexible and easily controllable and its implementation in Masaji et al would have been obvious to one of ordinary skill in the art at the time of invention.

**13. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masaji et al (JP 2001-035697) in view of Choi et al (US 2002/0023718).**

Masaji et al do not explicitly disclose that the variable impedance could be a variable inductance coil.

Choi et al disclose use of both variable capacitor and inductor for impedance matching.

Therefore having a variable inductance coil would have been obvious to one of ordinary skill in the art at the time of invention.

**14. Claims 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masaji et al (JP 2001-035697) or Yamakoshi et al (US 2001/0021422) in view of Nakamura et al (JP 2001094485).**

Yamakoshi et al do not disclose pickup coil and bridge rectifier with a capacitor to measure power.

Nakamura et al disclose a pick-up coil and a rectifier to convert to DC disposed proximately to an antenna (Abstract and Fig 3).

Therefore it would have been obvious for one of ordinary skill in the art to measure power in the way taught by Nakamura et al in order to be able to control it precisely in the apparatus of Yamakoshi et al.

**15. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masaji et al (JP 2001-035697) or Yamakoshi et al (US 2001/0021422) in view of Koji Oku (JP 08162291).**

Yamakoshi et al do not disclose a mixer for voltage and current signals to measure power.

Koji Oku disclose a high-frequency power source (Fig 1-10) comprising a matching box (30) and a power detection circuit (40), wherein the power detection circuit comprises a low pass filter (47) for conducting frequency mixing in double balanced mixers (46a, b) and removing the high-frequency components from the output of the double balanced mixers using local oscillator (45) and further low pass filter (49). Therefore power detection circuit converts the frequency of the high-frequency power to a low frequency and conducts detection based on the low-frequency power. Further the detected signal is used as negative feedback for control of high frequency power (Abstract and Fig 2).

Therefore it would have been obvious for one of ordinary skill in the art to measure power in the way taught by Koji Oku in order to be able to control it precisely in the apparatus of Yamakoshi et al.

**16. Claims 27-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masaji et al (JP 2001-035697) or Yamakoshi et al (US 2001/0021422) in view of Kojin Nakagawa (JP 08325759).**



Yamakoshi et al do not explicitly disclose controlling plasma by regulating antenna length.

Kojin Nakagawa discusses the relationship of length vs. wavelength/frequency and uniformity (Paragraph 7-10 and 34-35).

Therefore regulating the length to get maximum uniformity would be obvious to one of ordinary skill in the art at the time of invention.

### ***Response to Arguments***

Applicant's arguments filed 3/3/2008 have been fully considered but they are not persuasive.

Regarding claim 20, amended drawing 23 to show a capacitor sitting unconnected to any thing is not adequate to explain claim 20. Further capacitor is not used to pick up voltage in the proximity of the antenna. Capacitor could however be part of rectifier and filter used in the measurement circuit.

Applicant argues that Masaji et al do not disclose, teach or suggest, multiple RF antennas provided on an inner wall surface of the vacuum chamber so as to surround an inner space of the vacuum chamber, the limitation that adjacent electrodes of one or more pairs of adjacent RF antennas have the same polarity and the limitation of an impedance element connected to the RF antennas that regulates a current or voltage of each RF antenna.

In response it is noted that the plurality of antennas of the same type as claimed are installed and connected to power through impedance elements in the same way as claimed and shown in the specification.

Applicant argues that Yamakoshi fails to disclose multiple RF antennas provided on an inner wall surface of the vacuum chamber so as to surround an inner space of the vacuum chamber, where adjacent electrodes of one or more pairs of adjacent RF antennas have the same polarity, a plate-shaped conductor connected to the multiple RF antennas in parallel and arranged outside the vacuum chamber and an impedance element connected to the RF antennas that regulates a current or voltage of each RF antenna.

In response it is noted that the plurality of antennas of the same type as claimed are installed and connected to power through impedance elements in the same way as claimed and shown in the specification.

Applicant argues that Koji fails to teach or suggest that a plate-shaped conductor is arranged outside the vacuum chamber.

In response it is noted that the exact location of the plate like conductor being outside is only a rearrangement of parts and has been held obvious.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ram N. Kackar whose telephone number is 571 272 1436. The examiner can normally be reached on M-F 8:00 A.M to 5:P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571 272 1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ram N Kackar/  
Primary Examiner, Art Unit 1792